typically be used by providing with a draft.

The molding mold for fiber-reinforced plastic molding of the present invention can be used as a molding mold used in hand lay up molding, spray up molding, RIM (resin injection molding), VARI (vacuum assist resin injection) molding, vacuum bag molding and other general FRP molding, and there are no particular restrictions on the applications in which it is used.

Examples of the fiber-reinforced plastic molded article of the present invention include boat, jet sky and automobile parts, motorcycle parts, outdoor materials, bathtubs, waterproof pans and other molded articles requiring a smooth surface. These include FRP molded articles obtained by hand lay up molding, spray up molding and RTM molding, and there are no particular restrictions on their products or applications. In addition, the fiber-reinforced plastic molded article of the present invention can also be used in a wide range of applications of FRP molded articles requiring blister resistance and cracking resistance in addition to applications requiring a smooth exterior surface, a characteristic of the present invention.

Examples

Although the following provides a detailed explanation of the present invention by way of examples, the present invention is not limited to these Examples. In addition, the term "parts" in the explanation refers to parts by weight.

Synthesis Example 1 - Synthesis of Epoxy Acrylate

After adding 458 parts of Epicron 850 (epoxy resin manufactured by DAINIPPON INK AND CHEMICALS, INC.), having an epoxy equivalent of 189 obtained by reacting bisphenol A and epichlorhydrin, 215 parts of methacrylic acid, 0.35 parts of hydroquinone and 2.1 parts of triethylamine followed by heating to 110°C and reacting for 6 hours, 40.0 wt% of styrene monomer and 0.06 parts of trihydroquinone were added to obtain a resin composition containing 60.0 wt% epoxy acrylate and having a viscosity of 4.3 dPa·s. Moreover, 20 parts of styrene monomer were added to 100 parts of the resulting resin composition to obtain epoxy acrylate resin composition (1).

Synthesis Example 2 - Synthesis of Unsaturated Polyester

1509 parts of triethylene glycol, 664 parts of dipropylene glycol, 1887 parts of phthalic anhydride, and 221 parts of maleic anhydride were charged into a 5 liter four-mouth flask equipped with a thermometer, stirrer, inert gas feed port and reflux condenser followed by heating to 205°C in a nitrogen atmosphere. When the solid acid value reached 18.6, 0.10 parts of trihydroquinone and 27 wt% of styrene monomer were added to obtain a resin composition containing 73.0 wt% unsaturated polyester and having an acid value of 13.5 and a viscosity of 12.0 dPa·s. Moreover, 30 parts of styrene monomer were added to 100 parts of the resulting resin composition to obtain unsaturated polyester resin composition (2).

Synthesis Example 3 - Synthesis of Unsaturated Polyester

760.8 parts of propylene glycol, 620.7 parts of ethylene glycol, 1480 parts of phthalic anhydride, and 981 parts of maleic anhydride were charged into a 5 liter four-mouth flask equipped with a thermometer, stirrer, inert gas feed port and reflux condenser followed by heating to 205°C in a nitrogen atmosphere. When the solid acid value reached 40.5, 0.10 parts of trihydroquinone and 34 wt% of styrene monomer were added to obtain a resin composition containing 66.0 wt% unsaturated polyester and having an acid value of 26.7 and a viscosity of 10.2 dPa·s. Moreover, 25 parts of styrene monomer were added to 100 parts of the resulting resin composition to obtain unsaturated polyester resin composition (3).

Synthesis Example 4 - Synthesis of Unsaturated Polyester

837 parts of propylene glycol, 523 parts of ethylene glycol, 814 parts of phthalic anhydride, and 1618 parts of maleic anhydride were charged into a 5 liter four-mouth flask equipped with a thermometer, stirrer, inert gas feed port and reflux condenser followed by heating to 205°C in a nitrogen atmosphere. When the solid acid value reached 36.9, 0.10 parts of trihydroquinone and 34 wt% of styrene monomer were added to obtain a resin composition containing 66.0 wt% unsaturated polyester and having an acid value of 24.1 and a viscosity of 9.7 dPa·s. Moreover, 22 parts of styrene monomer were added to 100 parts of the resulting resin composition to obtain unsaturated polyester resin composition (4).

Synthesis Example 5 - Synthesis of Urethane Acrylate

174 parts of toluidine isocyanate (TDI) and 350 parts of PPG having a number average molecular weight of 700 were charged into a 1 liter four-mouth flask equipped with a thermometer, stirrer, inert gas feed port and reflux condenser and were allowed to react for 5 hours at 80°C in a nitrogen atmosphere. Since the NCO equivalents reached 530, which is nearly the same value as the theoretical value, and stabilized, the mixture was cooled to 40°C followed by the addition of 130 parts of 2-hydroxyethylmethacrylate and reacting for 4 hours at 80°C in a nitrogen atmosphere. After confirming the isocyanate group content (%) to be 0.1% or less, 0.05 parts of trihydroquinone and 0.025 parts of tertiary butylcatechol were added, and after lowering the temperature to 50°C, 440 parts of styrene were added to obtain polyurethane acrylate resin composition (5) containing 60% non-volatile resin and having a Gardner viscosity of I-J.

Synthesis Example 6 - Synthesis of Unsaturated Polyester

312 parts of neopentyl glycol, 159 parts of diethylene glycol, 50 parts of propylene glycol and 382 parts of isophthalic acid were charged into a 5 liter four-mouth flask equipped with a thermometer, stirrer, inert gas feed port and reflux condenser followed by heating to 210°C. After allowing to react until the acid value reached 2, 255 parts of maleic anhydride were charged into the flask followed by heating to 205°C in a nitrogen atmosphere. When the solid acid value reached 4.0, 0.10 parts of trihydroquinone and 585 parts of styrene monomer were added to obtain an unsaturated polyester resin composition (6) containing 61.5 wt% unsaturated polyester and having an acid value of 4.0 and a viscosity of 14.0 dPa·s.

Example 1

(Production of Casting Plate)

0.5 parts of 6% cobalt naphthenate as curing accelerator and 1.0 parts of 55% methylethyl ketone peroxide (MEKPO) as curing agent were added to 100 parts of a curable resin composition including a blend of 40 wt% of the epoxy acrylate resin composition (1) and 60 wt% of the unsaturated polyester resin composition (2) followed by the production of a casting plate in accordance with Section 5.2.3 of JIS-K-6919.